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Monitoring of Solar Energy using IOT

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Abstract*–Power predicament is a major upcoming issue in the society. Some of the non-renewable energy sources like thermal, nuclear energy are expensive and hazardous to the mankind. The conventional energy sources are limited and causes pollution to the environment also. To overcome these problems, eco friendly system will be a better solution. This paper deals with monitoring and controlling the voltage output of a solar panel kept at distant location and observing the output in the server using Internet of Things (IOT). Each server page consists of a unique IP address that allows the user to access the output page. Further controlling of solar panel outputs are enabled using relay boards and circuits. With the aid of this system, monitoring and controlling processis made easy and efficient.*

Keywords*: Internet of things (IOT),Solar Panel.*

I. INTRODUCTION

Fossil fuels plays a vital role for electricity generation all over the world. As energy consumption is increased gradually, the whole world including our country is faced with an issue of lack of back-up power. The basic concept behind the proposed model is monitoring and controlling the voltage output of solar panel at distant location using Internet of things(IOT). Power generated by solar panel is monitored in real-time and updated in server. Server updation helps real time tracking and monitoring of solar power generated in solar farms by using advanced processor PIC16F1947 which is a 16-bit microcontroller. Also GSM serves as an important part as it is responsible for controlling the load on the field and sends information to the receiver through coded signals. An integrated wired/wireless solution allows rapid growth of technologies by improving performances and productivity. The entire ranch can be controlled by IOT system, and it can be implemented based on the requirement of application.

II.NEEDFOR POWER GENERATION

The increasing costs of coal, oil, petroleum, nuclear and extension of power grid, leads to generate the power using renewable energy sources like solar energy.

EXISTING SYSTEM

Establishment of the Solar Parks have the potential of reducing the cost of electricity from solar power. The sensors are used to monitor and collect the information about the climatic condition of the farm like temperature, humidity, day/night mode and also to check the power generated on the field. GSM-based Wireless Sensor Network (WSN) has the features of high bandwidth and rate[5], non-line-transmission ability, large-scale data collection and high cost-effective, and it has the capability of video monitoring, which cannot be realized with ZigBee. For the wireless section, GSM type network has been used [5]because it is modern wireless sensor networks. Development of Real-Time automization of solar power system with various parameters being controlled by a microcontroller and maintained using the low power by adaption of wireless technology. The status of the load is monitored and data is stored at EEPROM, depending on the requirement of load application adequate facilities is chosen by the controller. Things get interesting when smart devices combines with smart services to create compound applications.

NEED FOR THE SYSTEM

The main objective is to develop a data acquisition system with less cost that continuously presents remote energy yields and performance measures. The proposed system is very useful for regular monitoring of field status without visiting manually, and saves time and also useful to monitor the load from hilly areas and remote areas, which were hard to visit in person. The system not only saves the energy usage significantly, but also reduces a large number of inputting on the human and material resources in the management. Applying embedded technology and wireless transceiver technology to the rapid deployment system of the incident detection of emergency load condition[5] environment without complicated connections, it increases the system's flexibility, reduce size, less cost and very effective, so it is easy to install and migrate.

SOLAR PANEL:

Solar panel, also known as solar module, photovoltaic module or photovoltaic pane converts solar energy into electric energy. The photovoltaic module is the result of group of PV cells in series or parallel and it comprises of the conversion unit within the system. Solar panels are made of wafer-based crystalline silicon cells or a thin-film cell made of cadmium telluride or silicon.

ANALYSIS OF SOLAR MODULE:

Solar cells are made from semiconductor structures and sun rays absorbed within this material emits electrons. This release activates a current.

The global formula to estimate the electricity generated is given by,

E=A*r*H*PR

E = Energy (kWh)

A=Total solar panel area (m2)

r =Solar panel yield (%)

H = Annual average solar radiation on tilted panels (shadings not included)

PR = Performance ratio, co-efficient for losses (range between 0.5 and 0.9, default value = 0.75

INTERNET OF THINGS:

Internet of Things is the emerging technology that promotes new levels of connectivity. IOT introduces a vision of future technology where different objects, users and computing systems are interlinked via internet. IOT is a network of different physical objects including sensors and actuators. Smart connectivity with existing networks and context-aware computation using network resources is an indispensable part of Internet of Things.

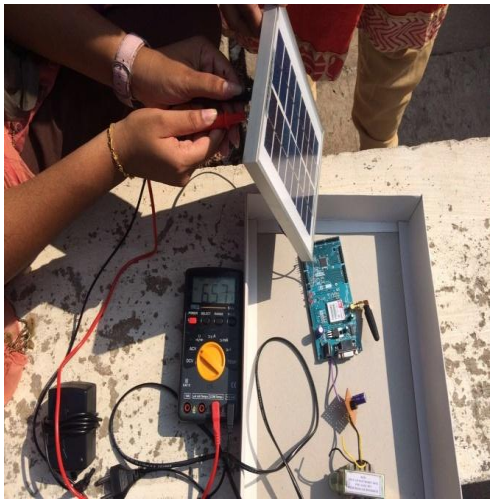
NEED FOR INTERNET OF THINGS (IOT):

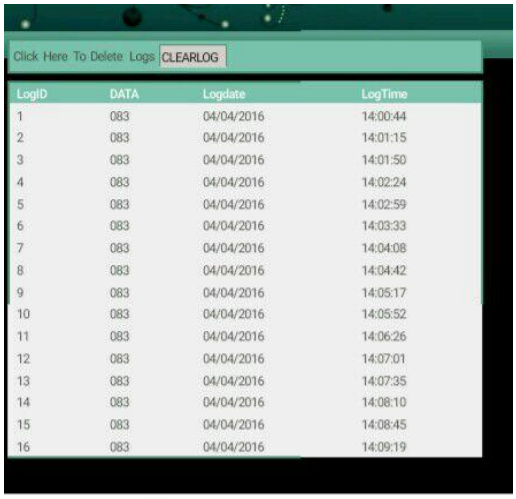
The network of interconnected things embedded with sensors, software, network connectivity and necessary electronics enables to collect and exchange data easily. The real-time data flow will be automatically updated in the server. The connection of various physical things to the Internet makes it possible to access remote sensor data and to control the physical world from a distance. This architectural framework allows integration and data exchange between the physical world and computer systems over existing network infrastructure.

IOT IMPLEMENTATION:

The solar panel kept at distant location is monitored and the voltage output levels are continuously updated in the server through the concept of IOT and. Each server page consists of an unique IP address that allows the user to access the output page. Further controlling of solar panel outputs is enabled using relay boards and circuits.

RESULTS :





LogID	DATA	Logdate	LogTime
1	083	04/04/2016	14:00:44
2	083	04/04/2016	14:01:15
3	083	04/04/2016	14:01:50
4	083	04/04/2016	14:02:24
5	083	04/04/2016	14:02:59
6	083	04/04/2016	14:03:33
7	083	04/04/2016	14:04:08
8	083	04/04/2016	14:04:42
9	083	04/04/2016	14:05:17
10	083	04/04/2016	14:05:52
11	083	04/04/2016	14:06:26
12	083	04/04/2016	14:07:01
13	083	04/04/2016	14:07:35
14	083	04/04/2016	14:08:10
15	083	04/04/2016	14:08:45
16	083	04/04/2016	14:09:19

MONITORING SOLAR PANEL DATA: Fig1:Solar panel output data

CONTROLLING PART: Input 00 Output Yellow(On) Green(On)

Input 10 Output Yellow(Off)Green(On)

Input 11 Output Yellow(Off)Green(Off)

Input01 Output Yellow(On)Green(Off) Fig 2:Controlling of solar output through relays

CONCLUSION:

Renewable energy sources are the non conventional type of energy which can be continuously relished by natural process. The solar panel voltage generation is one among the better solution for clean energy production by monitoring and controlling the voltage generated by our proposed system we could overcome the drawbacks of earlier proposed system. This topology allows us to power the load from solar panel with the available sun energy. This system has a low operating cost and finds its application in remote areas and also this method reduces the man power required.

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